is to be constructed.

In the first quarter of 1962 work is due to be completed at the Zaporozh'ye Refractory Plant on the production of a head specimen for a 1200-ton mechanical toggle press, as well as the production of high-alumina parts made of Kirovka Clay for air heaters in blast furnaces and checker brick for open-hearth regenerators.

The Semiluki Refractory Plant is to begin firing high-alumina chamotte in a rotary kiln; the new system for trapping dust in the flue gases from this kiln is to be started up, and high-density multichamotte parts are to be made for blast-furnace stack linings.

1500-ton hydraulic presses are to be started up at the Chasov-Yar Refractory Combine and the mass production of high-density magnesite-chrome parts is to be organized.

At the Konstantinovka Refractory Plant, "Red October" and Borovichi Combine, 1500-ton presses are to be installed and mass production of high-density ladle brick is to be organized.

The mass production of brick using chrome-alumina slags is to be organized at the Bogdanovich Refractory Plant.

The Yerevan Glass-Mullite Plant is scheduled to carry out measures aimed at greatly improving the quality of fused parts; by the end of the year the production of "bakor-33" is to be boosted to 120 tons a month.

Establishments and institutes of the refractory industry should move ahead in the introduction of techniques for the manufacture of new types of refractories by seeking the extra available reserves in industry for this purpose, by widely employing the initiative and creative effort of efficency-experts, inventors, design offices and plant laboratories.

A great deal of attention should be devoted to improving the output of powders and mixtures for concrete, non-fired blocks and parts, of great importance for the rapid introduction of industrial methods of kiln construction.

For the purposes of improving the equipment available in the refractory industry, the engineering industry should supply refractory establishments with a large amount of contemporary mixing and pressing equipment, rotary and electrothermal kilns and equipment for tunnel-type kilns.

It is the job of the staffs of refractory establishments to carry out the plans for the manufacture of new equipment and for putting it into service as quickly as possible.

The fulfilment of the production and construction programs scheduled for 1962 and also the measures for the installation and starting up of new machinery at refractory establishments will make it possible to raise the technical level of refractory enterprises, to boost the output of super-duty refractories and satisfy the needs of the national economy in high grade refractories more fully.

The tasks facing the refractory industry are complex, but there is no doubt that the staffs of refractory enterprises and institutes, inspired by the historic solutions of the XXII Communist Party Congress, will help carry them out honorably.

PRODUCTION

PRODUCTION OF SHAPED CHECKER BRICK FOR BLAST FURNACE AIR BEATERS

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(Semiluki Refractory Plant)

In order to reach blast temperatures of the order of 1200° and to improve the efficiency of air heaters, apart from using super-duty materials it is advisable to alter the shape of the checker brick in order to increase the heating surface.

The authors of this article have supplied an efficient checker brick shape (Figure 1).

Two types of experimental brick were made: chamotte brick with 36-39% Al_2O_3 and high-alumina with 45-50% Al_2O_3.

Chamotte brick. Both class A and B chamotte brick were manufactured for the air heaters by the standard production technique for shop No. 1.

Chamotte with 4.5-6% water absorption, made from LT-2 clay fired in a shaft-type kiln, was used to make the class A air heater brick, while the brick used for Class B was chamotte with 8-11% water absorption made from LT1PK, LT2PK and LTU clays.

The grain composition of the chamotte was as follows: 3% fraction coarser than 3 mm; 59±5% 3-0.5 mm; 38±5% finer than 0.5 mm. The binder used was LT1 and LT2 clays containing not more than 1% fraction coarser than 1 mm and at least 70% finer than 0.5 mm. The mixture was tempered in mullers or roller mills for 5-7 minutes. The composition of the charge was: 80-75% chamotte and 20-25% clay, and the moisture content of the mixture was: 6-8%.

Parts were mixed on SM-143 presses, except for certain types in Class A which were made on "International Presses".

The bulk density of the green wire for the class A part at least 2.15 g/cm³ and at least 2.00 g/cm³ for Class B parts.

The green ware was dried in tunnel-type dryers until the residual moisture content was 1.0-2.5%, after which it was

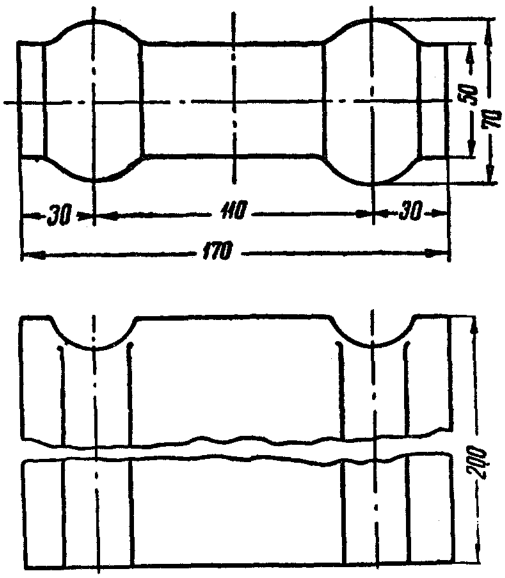

Fig. 1. K-2 Checker brick

fired in tunnel-type kilns at 1420-1460°, 16-19 cars being passed through per shift.

The characteristics of the finished product are shown in Table 1.

High-alumina brick. The high-alumina air-heater brick was manufactured in the following way.

As the binder for the charge we used LT-1 clay, and for the balance we used chamotte made of LT-1 clay and ground industrial alumina.

Composition of the chamotte was: 2% coarser than 4 mm; 10-20% fraction 4-2 mm; 28-35% finer than 0.5 mm, including 12% finer than 0.088 mm.

The industrial alumina ground in a tubular mill contained 29-34% fraction finer than 1 micron. The charge composition was: 73% chamotte, 12% ground industrial alumina and 15% Lt-1 clay.

The mixture was prepared in mullers in the following sequence: the bowl was filled with chamotte and alumina, mixed in the dry form for 1-1/2 to 2 minutes and then moistened with slurry and remixed for 2 minutes, after which the clay was added and the mixture was tempered for another 3 minutes. The moisture content of the mixture was 5.5-6.5%.

The parts were pressed on SM-143 presses at 4-8 cycles per minute. The bulk density of the green material was 2.25-2.29 g/cm^3. The amount of spoilage due to broken corners and faces was not greater than 1-2%. The batching system is shown in Figures 2 and 3. The parts were dried in a tunnel-type dryer until the residual moisture content was 1-2%, and were then fired in a tunnel-type kiln in shop No. 4 at 1480-1500°, 6 cars passing through per shift. The characteristics of the parts are shown in Table 2.

As agreed with the consumers, the checker brick made was type K-2N (Figure 4). Preliminary calculations show that the use of this brick makes it possible to increase the heating surface of air heaters without altering the overall dimensions. The way the brick was laid is shown in Figure 5.

The experiments showed that when the shape of the brick is simplified, pressing is made easier, labor productivity is improved and the amount of spoilage is reduced.

The use of the K-2N brick makes it possible to increase the cell size in air heaters from 45 × 45 mm to 60 × 60 mm without altering the heating surface. The brick can be laid on existing sub-checker devices with a cell size 60 × 60 mm.

CONCLUSIONS

The Semiluki Refractory Plant has begun production of

TABLE 1

PHYSICAL-CHEMICAL PROPERTIES OF CHAMOTTE BRICK FOR BLAST-FURNACE AIR HEATERS

Values	Refractoriness °C	Refractoriness under-load of 2 kg/cm^2	Additional shrinkage at 1300°, %	Spalling resistance, water heating-cooling cycles (cooling from 850°)	Apparent porosity, %	Bulk density, g/cm^3	Compressive strength, kg/cm^2	Content, %		
								Al_2O_3	TiO_2	Fe_2O_3
Class A checker										
Mean	1730	1385	0,20	>25	20,5	2,07	255	36,53	1,75	1,28
Maximum	1730	1400	0,30	—	25,2	2,16	545	38,30	2.00	1,40
Minimum	1730	1360	0,02	—	16,7	2,00	178	35,11	1,43	1,00
Class B wall										
Mean	1730	1401	0,16	>16*	17,5	2,13	455	38,34	1,88	1,33
Maximum	1730	1410	0,30	—	19,8	2,23	570	39,32	2,00	1,40
Minimum	1730	1380	0,05	—	14,8	2,05	253	37,08	1,82	1,25
Class B checker										
Mean	1713	1380	0,20	>25	23,5	1,96	238	33,25	1,7	1,11
Maximum	1720	1390	0,35	—	26,0	2,06	436	35,48	1,9	1,30
Minimum	1710	1360	0,05	—	20,8	1,87	153	31,53	1,6	1,00

*Cooling from 1300°

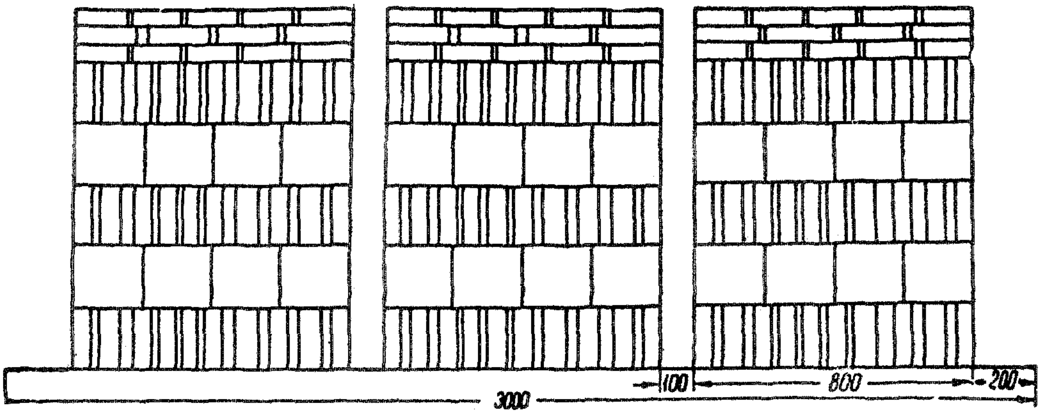

Fig. 2. Batching system for K-2N brick on kiln cars 3 3,1 m in shop No. 4

TABLE 2

CHARACTERISTICS OF PARTS MADE OF CHARGE WITH ADDED INDUSTRIAL ALUMINA

Characteristics	Refractoriness, %	Refractoriness-under-load of 2 kg/cm²	Additional shrinkage at 1400°, %	Spalling resistance, water heating-cooling cycles (cooling from 850°)	Apparent porosity, %	Bulk density, g/cm³	Compressive strength, kg/cm²	Content, %		
								Al_2O_3	TiO_2	Fe_2O_3
Mean	1780	1422	0,21	>110	18,3	2,20	535	45,77	1,66	1,24
Maximum	1780	1430	0,30	—	21,2	2,31	848	48,73	1,82	1,30
Minimum	1780°	1410	0,07	—	15,2	2,09	285	43,70	1,40	0,95

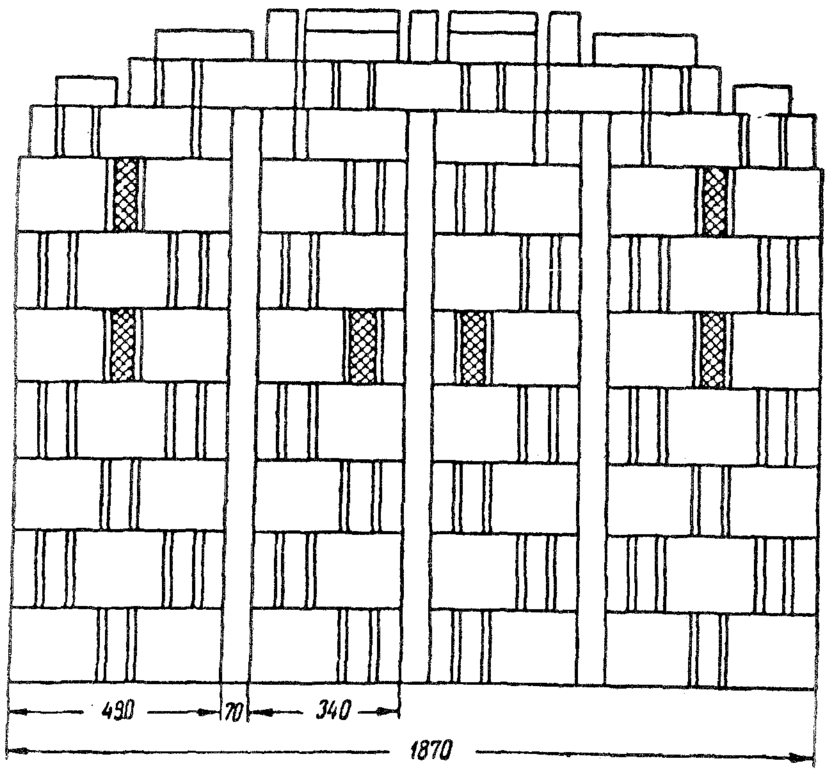

Fig. 3. Batching system for K-2N brick on kiln cars in shop No. 1

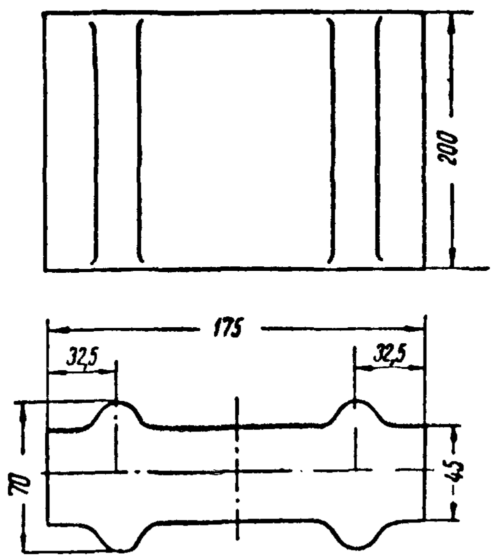

Fig. 4. K-2N brick

chamotte and high-alumina shaped checker brick, type K-2N.

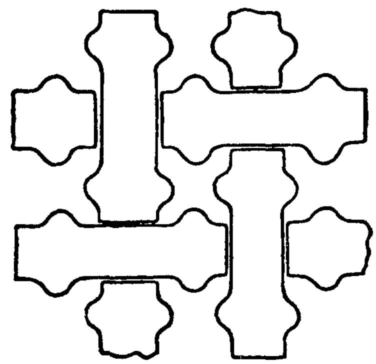

Fig. 5. System of laying K-2N brick in blast-furnace air-heater checker

The use of this brick makes it possible to step up the hot blast temperature and makes it easier to operate the air heaters.

Thermal tests should be carried out on air heaters with checkers made of K-2N brick in order to obtain fuller data on the effectiveness of using it.

EXPERIMENT IN FIRING NOVOSELITSA KAOLIN IN ROTARY KILN

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The raw material was studied at the laboratories of the All-Union and Ukrainian Refractory Institutes and also under semi-works conditions.

The investigations showed that Novoselitsa Kaolin can be made into chamotte in rotary kilns. The chamotte obtained exhibits low water absorption, and, according to the Ukrainian Refractory Institute, when it is compacted, vacuumed and different additives are added, the dust loss can be reduced to 1.5-8.0%.

In order to be able to select the basic parameters for the planned chamotte-firing plant, an experimental batch of kaolin was fired in a rotary kiln at the Zaporozh'ye Refractory Plant. The mean chemical composition of the kaolin, as determined by the plant laboratory, is shown in Table 1.

The raw material was prepared for firing by the normal procedure employed at the plant, using press-rolls (see diagram).

The experiments were conducted in two stages. At the first stage, which lasted 10 hours, we fired lump raw materials. At the second stage, which lasted 19 hours, we fired lump materials, compacts obtained by moistening the raw materials with water, and compacts made with the addition of water glass.

A special unit was assembled for introduction of the additives. The lumpy materials were passed through a clay cutter, disk feed and rotary kiln.

When the raw material had been compacted, it was fed to the two-high mixer, press-rolls, disk feed and rotary kiln. The yield of compacts after the rolls was 50% of the weight of the loaded kaolin, the remaining material reaching the kiln as fines. The dimensions of the compacts were 50 × 40 mm. The compacts were not destoyed after being dropped five times onto a metal plate from a height of 1.5 m.

The operational characteristics of the kiln are shown in Table 2.

The regime for both stages is practically the same, except for an increased gas consumption during the second stage, in accordance with which the oxygen content and air surplus coefficient in the edge of the kiln are reduced.

Observation of the behavior of the raw material in the rotary kiln shows that as the temperature rises, small-size